

The modeling and simulation of control system based on Matlab/Simulink

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Abstract

The control system using Matlab/Simulink modeling and simulation is briefly discussed, and combined with typical application examples are analyzed in the simulation control system.

Keywords

Matlab/Simulink, Control system, Modeling.

1. Introduction

Matlab plays a very important role in both mathematics and engineering. In the past, we care more about the mathematics model. However, this is just a part of matlab's powerful analysis function. For its control system matlab/simulink Some of our attention is often not enough, this article is for this part of the software to explain the examples and the conclusions of the operation, for the reader to explain vividly, so that the software has a more intuitive and comprehensive understanding

2. The establishment of Simulink model

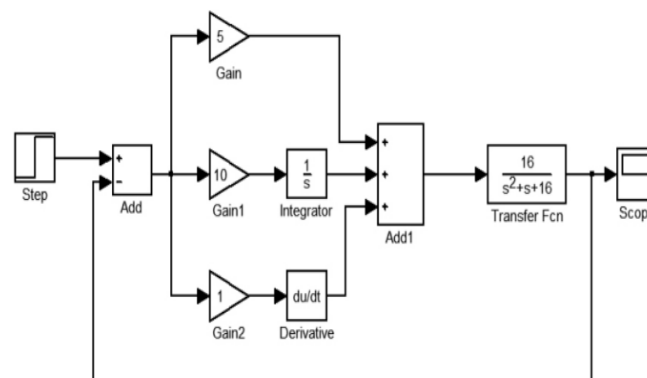


Fig.1 PID closed-loop system control model

Find the required module in the Simulink module library, add it to the model window, drag the module to a suitable location, adjust the shape of the module to the appropriate size, and finally rename the module to complete the module's operation tasks. Double-clicking a module in the Simulink model allows the user to set parameters for almost all modules. The basic module parameter setting method of the Simulink module library is basically similar. Double-click or use the menu command to open the module property dialog box and set each parameter according to the system requirements.

In the module wiring loop, if the single-ended output module requires a branch connection, it is recommended to use the anti-connection method. The so-called anti-connection is the method of dragging the mouse from the target module to the starting module. This method can be used if no branch connection is required. Dragging the mouse directly from the start module to the target module is a simple and quick branch connection of the module.

3. Realize control system simulation example analysis

3.1 Establishment of PID closed-loop control system model

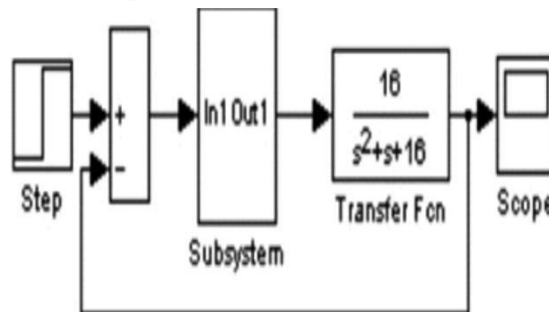


Fig.2 PID closed-loop control subsystem model

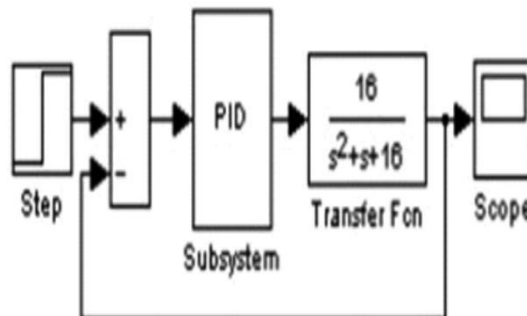


Fig.3 PID closed-loop control system package model

The simulation results are shown in Figure 4:

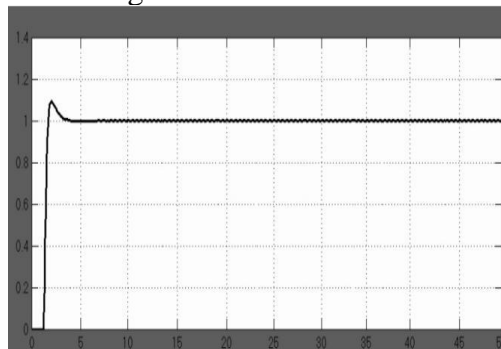


Fig.4

Conclusion: With PID control, the stabilization time becomes shorter, the overshoot becomes smaller, and the overshoot is smooth and rapid.

3.2 Dynamic Simulation of Bungee Jump System

ercise that challenges the limits of the body. The bungee jumps down from a height with a flexible rope. In the process of falling, the bungee almost loses weight. According to Newton's laws of motion, the mathematical model of the entire bungee system is:

$$m = mg + b(x) - a_1 x - a_2 |x| \tag{1}$$

$$\{ -kx, x > 0 \quad b(x) = 0, x \leq 0 \}$$

Assuming that the squatter is on a ladder above a 50m bridge, the height of the ladder is 30m and the initial speed is 0. The remaining parameters are: The elasticity coefficient of the rope is:

$$20, a_2 = a_1 = 1; m = 70, g = 10m/s^2 .$$

In order to observe the complete dynamic map of the squatter in the sky, set the simulation time 100s. In order to make the curve smooth, set the simulation step's max value to 0. 2, the simulation results shown in Figure 5:

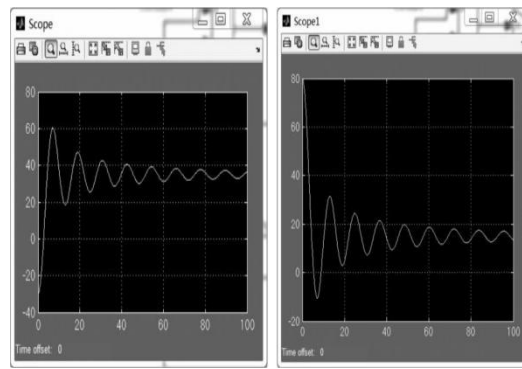


Fig.5 Simulation results of a bungee jump system

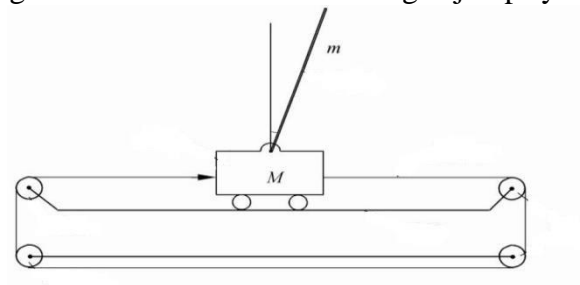


Fig.6 Single-stage inversion

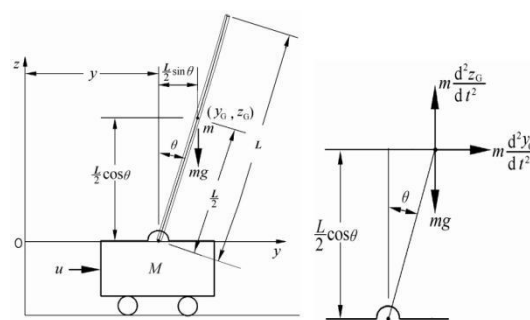


Fig.7 Force analysis diagram of single inverted pendulum

4. Conclusion

Modeling and simulation using MATLAB/Simulink are intuitive and accurate in motion analysis. Here, the simulation of the pole-jumping system intuitively illustrates the time and speed of the bungee jumping.

References

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